CRISTAL STANDARDS FOR BAR CODING AND LABELING OF AGRO PRODUCTS

TECHNICAL GLOSSARY

BIBLIOGRAPHY

Version 1.0

INTRODUCTION

In discussions and as well in practical experience the Cristal Team discovered that there is diversity in interpretation of technical terms and abbreviations. To make sure that we talking a common language in the Agro Industry and for better understanding in general we assembled the most common terms, abbreviations and expressions.
This document shall list furthermore the terms and definitions used in different Cristal documents such as the *"Cristal Standards for Bar Coding and Labelling of Agro Products"* in a very general and generic form. The document cannot replace a more detailed description. For more detailed information we refer to further reading and links which providing a higher and more specific information content. The document is owned by CRISTAL and provided for information purposes only.

The document has been divided in several chapters:

A = Glossary
B = Bibliography
C = Further reading
D = Links

The terms and definitions of the ISO/IEC 19762 part 1 and 2 are generally binding.

A GLOSSARY

Aggregation: Is the act of assigning child-level serial numbers (such as on individual packages) to a unique serial number at the parent level (e.g., a case), thus forging an electronic association between the children and the parent. Each time goods are grouped, that's an occasion for aggregation: individual unit packages to bundles; bundles to cases; cases to pallets. Could be effected either by a partly or a full-aggregation. Aggregation is essentially an electronic data representation of grouped physical goods. Sometimes interchangeably used with "hierarchy." Regardless of what you call it, the electronic representation must always match the physical.

Agro EDI Europe: Is an association committed since its inception in 1992, in the development of electronic data interchange (EDI) in the agricultural sector. The mission is to support the evolution of different types of data exchanges and standardize them. Agro EDI Europe and UN / CEFACT at the international level, ensure the creation of standardized messages and normalized specific to those in the agricultural environment.

Association: Logical grouping of serialized "child" product objects within a unique serialized "parent" packaging object, such as primary packs to secondary packs, bundles to shipping container, shipping container to pallets.

Automatic Identification and Data Capture (AIDC): Refers to the method for automatically identifying objects, collecting data about them and entering data directly into computer systems.

Authentication: Is the act of confirming the truth of an attribute of a datum or entity. This might involve tracing the origins of an artefact, or ensuring that a product is what it's packaging and labelling claims to be. Authentication will mostly guarantee the packaging has not been tampered with. We distinguish between overt = check with naked eye and covert attributes = check with additional device.

Barcode: A barcode (also bar code) is a machine-readable representation of information format on a surface. Originally barcodes stored data in the widths and spacing's of printed parallel lines, but today they also come in patterns of dots, concentric circles, and hidden in images. Barcodes can be read by optical scanners called barcode readers or scanned from an image by special software.

Barcode reader (or barcode scanner): Electronic device for reading printed barcodes. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain decoder circuitry analysing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port. For the reading of 2D Barcodes camera inspection systems or smartphones for the end-users are most common.

Barcode Reading Vision Tool (BCR): Is a camera verification tool for barcode inspection through vision. This component establishes whether a barcode is present, if it contains the correct data and if the physical barcode symbol is legible. After this determination has been made, the vision sensor uses communication tools to send inspection data via serial or Ethernet communications to a PLC or PC. Sensors that offer configurable I/O do more than share the collected inspection data - they apply it by categorising products according to the data that each barcode contains, as well as diverting any incorrect or illegible barcodes from the line.

Commission: Is a serialized item that has passed all inspection points on the filling line and is available to be packed into a serialized parent downstream.

Counterfeit products: Are often offered to consumers as being authentic. Efforts to control the supply chain and educate consumers to evaluate the packaging and labelling help ensure that authentic products are sold and used. Even security printing on packages, labels, and nameplates, however, is subject to counterfeiting.

Continuous Ink-jet (CIJ): Inkjet printing is a type of computer printing that creates a digital image by propelling droplets of ink (Dotcodes) onto paper, plastic, or other substrates. A high-pressure pump directs liquid ink from a reservoir through a gun body and a microscopic nozzle, creating a continuous stream of ink droplets via the Plateau-Rayleigh instability. A piezoelectric crystal creates an acoustic wave as it vibrates within the gun body and causes the stream of liquid to break into droplets at regular intervals. The ink droplets are subjected to an electrostatic field created by a charging electrode as they form; the field varies according to the degree of drop deflection desired. This results in a controlled, variable electrostatic charge on each droplet.

CRISTAL: is an acronym meaning **C**ommunicating **R**eliable **I**nformation and **S**tandard **T**o **A**griculture and **L**ogistic. This is an initiative started at the end of the 90's to develop a common standard that will promote the use of traceability and ecommerce within the agro chemical industry in Europe in collaboration with CropLife International.

DataMatrix Code: DataMatrix is a 2D barcode symbology with very high data density. Data Matrix symbols are printed in square or sometimes a rectangular pattern. Each dot of a DataMatrix symbol represents a bit. This is in contrast to linear bar-codes, where the information is encoded in the ratio of the bars or spaces to each other. Usually a black dot in a Data Matrix symbol is equivalent with the bit-value 1.

DataMatrix Code GS1 (ECC200) or synonym 2D-Code: Because of its technical advantages the GS1 organization considered the DataMatrix 2D barcode symbology for its system.
The so called GS1 or EAN Data Matrix is a standard DataMatrix symbol (ECC 200) with an internal GS1 identifier in the data structure (like the FNC1-Prefix in a GS1-128). The use of Application Identifiers is supported; this is comparable to the linear barcode GS1-128/EAN-128 or GS1 DataBar Expanded, where a code word similar to FNC1 acts as a field separator.
http://www.gs1.org/docs/barcodes/GS1_DataMatrix_Introduction_and_technical_overview.pdf

Data Identifier (DI) or synonym Application Identifier (AI): It identifies data with Application Identifiers (AI). Without spaces below, a simple SSCC (Serial Shipping Container Code) barcode would look something like this: [FNC1] 00 12345678 0000000001.
By using of Application Identifier it is possible to encode several pieces of data in one barcode. For example a production date (code 11), and expiration date (code 17) together would look something like this: [FNC1] 11 130801 17 160801. All dates are formatted as YYMMDD.

Decommission: A serialized item which has been marked as unavailable for downstream packaging operations. Decommissioning can occur automatically as part of the packing process or manually by an operator e.g. through scanning.

DESADV: The document identifier for Shipping Schedule sent using the EDIFACT standard. The document informs a buyer in advance that a supplier is shipping product. Information on the document usually includes information about the carrier and serves as an electronic packing slip. A bar code shipping label is frequently associated with this document.

EDIFACT: The United Nations EDI standard; EDI for Administration, Commerce, and Transport. The Data Interchange Standards Association (DISA) serves as the U.S. link with the UN EDIFACT process. The EDIFACT standard is used in the US automotive and industrial supply chains. EDIFACT is the dominate standard in Europe.

e-business: Electronic Business, the process of using Web technology to help businesses to streamline processes, improve productivity and increase efficiencies. Enables companies to easily communicate with partners, vendors and customers, connect back-end data systems and transact commerce in a secure manner.

e-commerce: Electronic commerce; the exchange of information about goods or services via the Internet; the ability to buy and sell products and services over the Internet. May include ordering, billing, customer service and handling of payments and transactions.

ePedigree: (or electronic pedigree) is an electronic document which provides data on the history of a particular batch of a drug during the whole lifecycle. A drug pedigree is a statement of origin that identifies each prior sale, purchase, or trade of a drug, including the date of those transactions and the names and addresses of all parties to them

Electronic Data Interface (EDI): Is a document standard which when implemented acts as common interface between two or more computer applications in terms of understanding the document transmitted. It is commonly used by big companies for e-commerce purposes, such as sending orders to warehouses or tracking their order. It is more than mere e-mail; for instance, organizations might replace bills of lading and even cheques with appropriate EDI messages. It also refers specifically to a family of standards.

Encryption: Encryption is the conversion of data into a form, called a cipher, which cannot be easily intercepted by unauthorized people. Decryption is the process of converting encrypted data back into its original form, so it can be understood.

ECC200: The term ECC200 refers to DataMatrix symbols which are generated according to the latest (and most sophisticated) built-in error correction methods.

Enterprise Resource Planning (**ERP)**: Is a cross-functional enterprise system driven by an integrated suite of software modules that supports the basic internal business processes of a company. ERP gives a company an integrated real-time view of its core business processes such as production, order processing, and inventory management, tied together by ERP applications software and a common database maintained by a database management system.
ERP systems track business resources (such as cash, raw materials, and production capacity) and the status of commitments made by the business (such as customer orders, purchase orders, and employee payroll), no matter which department (manufacturing, purchasing, sales, accounting, and so on) has entered the data into the system.
ERP facilitates information flow between all business functions inside the organization, and manages connections to outside stakeholders. It is a critical part of the tracking and tracing process. A very popular ERP System is SAP.

Error Correction: DataMatrix offers a built-in error correction method based on Reed-Solomon algorithms. The error correction level is not adjustable by the user but it is possible to restore approximately 25% of unreadable code words in a Data Matrix symbol without data loss.

Electronic Product Code (EPC): The Electronic Product Code (EPC) is designed as a universal identifier that provides a unique identity for every physical object anywhere in the world, for all time. EPC identifiers currently support 7 identification keys from the GS1 system of identifiers.

Electronic Product Code Information Services (EPCIS): is an EPC global standard of GS1 that specifies a uniform way to electronically transmit between trading partners a detailed representation of supply chain events.

File Transfer Protocol (FTP): A mature service that transfers files from one computer to another computer over the internet

Firewall: A security system for protecting a server and local area network. A firewall monitors and manages traffic in and out of a network while limiting access to authorized users and programs.

Global Electronic Party Information Register (GEPIR): Is a distributed database that contains basic information on over 1,000,000 companies in over 100 countries. The service is provided jointly by different GS1 Member Organizations.

Grading: Verification e.g. with smartphones requires a certain grading in order to avoid non or difficult reading. Compared with a reader, a verifier measures a barcode's optical characteristics to international and industry standards. The measurement must be repeatable and consistent. Doing so requires constant conditions such as distance, illumination angle, sensor angle and verifier aperture. Based on the verification results, the production process can be adjusted to print higher quality barcodes that will scan down the supply chain.

Quality Level according ISO/IEC 15415 Level A=best to F=fail (see Quality Level). According ISO (ANSI) nine parameters have to be inspected.

- Symbol Contrast
- Modulation
- Decode
- Unused Error Correction
- Fixed (finder) Pattern Damage
- Grid Non-uniformity
- Axial Non-uniformity

Global Data Synchronization Network (GDSN): Part of GS1 Standards. Allows real-time master sharing between trading partners.

Global Location Number (GLN): Is an acronym from the GS1 standard it means Global Location Number. It is a simple tool used to identify a location and can identify locations uniquely where required. The GS1 Identification Key is used to identify physical locations or legal entities. The key comprises a GS1 Company Prefix, Location Reference, and Check Digit. Location identified with GLN could be a physical location such as a warehouse or a legal entity such as a company or customer or a function that takes place within a legal entity. It can also be used to identify something as specific as a particular shelf in a store. Being able to identify locations with a unique number is a key to many business processes. The GLN is used in electronic messaging between customers and suppliers, where location advice is important. GLN is also used within companies to identify specific locations both electronically in a database and physically where the GLN can be produced in a bar code or GS1 EPC tag.

Global Standard One (GS1): Supply Chain standards Organization with core sectors in retail, transport & logistics. Registered as IA, manages worldwide GS1 numbering system. GS1 is an international non-profit association dedicated to the development and implementation of global specifications to management of supply and demand chains across multiple sectors. GS1 finances itself by selling the company code identification to their members. Additionally GS1 offers conferences, consulting for using GS1 specifications and trainings for members and non-members.

GS1-128 Label: Bar code label that is placed on each carton to be shipped to a customer. The label typically includes the purchase order number, the store location the goods are being sent to and a description of the contents in the carton. When the carton arrives at the customer's location, the barcode label is scanned. The barcode number is matched with the Advance Ship Notice EDI transaction that was previously sent. The carton is then routed to the appropriate area and the contents of the carton are released into inventory using the information on the Advance Ship Notice EDI transaction. For vendor payment purposes, scanning the GS1-128 bar code confirms that the order has been received.

Global Trade Item Number (GTIN): Part of the GS1 Standards. Is an identification key that uniquely identifies a product.

GTIN-14: The 14-digit GS1 Identification Key composed of an Indicator digit (1-9), GS1 Company Prefix, Item Reference, and Check Digit used to identify trade items.

Handheld (HH): A handheld is a wired or wireless device for hand operations.

Human Machine Interface (HMI): Human–machine interaction is the space where interaction between humans and machines occurs. The goal of this interaction is effective operation and control of the machine on the user's end, and feedback from the machine, which aids the operator in making operational decisions. The interface itself could be a touchscreen or a pushbutton.

Match String: A group of x number of alphanumeric characters. For a particular inspection individual characters obtained from package components through technologies such as barcode decoding

Message: The communication of information from a source to one or many destinations. This term can be used to describe a set of transactions in Electronic Data Interchange (EDI) or Extended Mark-up Language. The transaction can include data for a purchase order, a shipping notice, or any other electronic document.

Multimedia Messaging Service (MMS): Multimedia Messaging Service (MMS) is a standard way to send messages that include multimedia content to and from mobile phones. In our interpretation the consumer send 2D Code captured by camera-equipped handsets from the product to the manufacturer or authorized body. The supplier or authorized body answers with the confirmation that the product is genuine or other relevant product information.

Manufacturing Execution System (MES): Computerized systems used in manufacturing. MES work in real time to enable the control of multiple elements of the production process (e.g. inputs, personnel, machines and support services).

Optical Character Recognition (OCR): Is the mechanical or electronic conversion of scanned images of handwritten, typewritten or printed text into machine-encoded text. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

Programmable Logic Controller (PLC): Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines.

Primary Packaging: The first level packaging of the product. In our industry this is mainly a bottle, a canister or sack. Bulk products packed in IBCs are exceptions and not subject of our examination.

Product Identification: Is the checking of a number coupled with the product. Like a license plate, this identification will confirm the uniqueness of the product (serial number).

Product Traceability: Software & data management for complete visibility of products and raw materials throughout the supply chain.

Point-of-Sale (POS): Consumers can check the originality of a product with a smartphone directly at the POS. For that they have to scan the 2D-Code and follow the instructions of the website they are directed to.

Quality Level: It is important to verify a barcode to ensure that any reader in the supply chain can successfully interpret a barcode with a low error rate. Quality assessment test of the code shall be affected according ISO/IEC 15415. Grade C is the accepted standard desired by the commerce for Agro Products. In the worst case the quality should never fall below Grade 0,5 (fair).

ISO/ IEC-Class	ANSI Grade	On multiple measuring	meaning
4	**A**	**3,5-4,0**	**very good**
3	**B**	**2,5-3,49**	**good**
2	**C**	**1,5-2,49**	**satisfactory**
1	**D**	**0,5-1,49**	**fair**
0	**F**	**below 0,5**	**fail**

QR Code: (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode). A barcode is an optically machine-readable label that is attached to an item and that records information related to that item. The QR Code system has become popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard linear. The inclusion of QR Code reading software on camera phones has led to a wide variety consumer-oriented applications. QR Codes storing addresses and URLs are becoming increasingly common in magazines and advertisements.

Randomized Serial Number (RSN): Not deterministic generated serial-number. A deterministic algorithm computes a mathematical function; a function has a unique value for any given input, and the algorithm is a process that produces this particular value as output. It is very unlikely that a randomized good encrypted serial number can be anticipated or guessed by falsifiers.

Radio-Frequency Identification (RFID): Is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by and read at short ranges (a few meters) via magnetic fields (electromagnetic induction). Others use a local power source such as a battery, or else have no battery but collect energy from the interrogating EM field, and then act as a passive transponder to emit microwaves or UHF radio waves (i.e., electromagnetic radiation at high frequencies). Battery powered tags may operate at hundreds of meters. Unlike a bar code, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object.

SAP ECC: Is a synonym of SAP ERP. It is the R/3 version that includes all modules related to a standard enterprise resource planning system.

SAP or SAP AG: Is a European multinational software corporation that makes enterprise software to manage business operations and customer relations. SAP is the leader in the market of enterprise applications in terms of software and software-related service. The company's best-known software products are its enterprise resource planning (ERP) application systems and management. This is most of the time what people are commonly calling SAP as a nick name of their ERP system.

SAP OER: The SAP Object Event Repository provides scalable, object-level event processing throughout the supply chain. It enables discovery, tracking, reporting – supporting business processes such as product tracking and authentication.

- Acquire a data repository for events, observations, hierarchies, and associated information
- Maintain each serialized object as an event handler, with an event processor
- Distribute valid and unique number ranges using central number-range management
- Track and trace business objects and processes within and beyond enterprise boundaries
- Obtain analytics functionality, including predefined content for the SAP Net Weaver platform

SAP AII: Means SAP AutoID software system. This is a module of SAP that is used to integrate RFID reader, scanner and barcode readers. SAP AII helps enterprises in managing inventory and shipping of goods from inventories as well as goods receipt on the recipient's side using RFID devices together with the back-end functionality of enterprise software applications such as supply chain management and ERP.

Secondary Packaging: A level of packaging that may contain one or more primary packages or a group of primary packages containing a single item. In our industry this is mainly the shipping carton.

Serial Number (SN): A serial number is a unique code assigned for identification of a single unit.

Serialization: The process of assigning a unique number to each product package such that different packages of the same product are distinguishable. In our meaning this includes Item-level serialization

Serial Shipping Container Code (SSCC): Is an 18-digit number used to identify logistics units. The SSCC is often encoded in a barcode, generally GS1-128, and used in electronic commerce transactions. The SSCC comprises an extension digit, a GS1 company prefix, a serial reference, and a check digit. It is all numeric. It is applicable to secondary and tertiary level of packing. The SSCC is commonly used in the advance ship notice (ASN) EDI transaction.

Stock Keeping Unit (SKU): An SKU number refers to a particular item or part. A UPC number may be assigned to an SKU by the UCC.

Supply Chain: is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials, and components into a finished product that is delivered to the end customer. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable.

Supply Chain Management (SCM): SCM refers to the effective integration of the processes related to the forecasting of the product's market demand, the acquisition of the raw materials to make the product, its manufacturing, the inventorying of the product, its transportation to market, its eventual sale (or the fulfilment of demand), and the measurement of the satisfaction of the customer who purchased it. Combines the power of the Internet with the latest technology, enabling participating suppliers to access up-to-date company information and enabling companies to better manage and track supply and demand.

Traceability: Is the ability to verify the history, location, or application of an item by means of documented recorded identification.

Transmission Control Protocol/Internet Protocol (TCP/IP): The basic communication language or protocol of the Internet. It can also be used as a communications protocol in intranets and extranets.

Thermal Transfer Printing: Is a digital printing process in which material is applied to paper (or some other material) by melting a coating of ribbon so that it stays glued to the material on which the print is applied.

Track & Trace or Tracking and Tracing: The process of being able to follow a product movement through the supply chain in both the forward (Track) and backward/ reverse (Trace) direction. Products are traced for purposes like product recall and investigating complaints. Track & Trace is a complete visibility of the flow of goods in both directions.

UN/ CEFACT: Within the United Nations framework of the Economic and Social Council, the United Nations Economic Commission for Europe (UNECE) serves as the focal point for trade facilitation recommendations and electronic business standards, covering both commercial and government

business processes that can foster growth in international trade and related services. In this context, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) was established, as a subsidiary, intergovernmental body of the UNECE Committee on Trade, mandated to develop a programme of work of global relevance to achieve improved worldwide coordination and cooperation in these areas.

Universal Product Number (UPN) Repository: An online database with product master data. The GS1 Database for GTIN 13 Codes (formerly EAN13) is such a repository. Global Electronic Party Information Register (GEPIR) is a worldwide database of companies who participating in the ILN/EAN System. You can search by GTIN (includes UPC and EAN-13), SSCC and GLN numbers or by company name in some countries. Results can be returned in HTML or XML for some countries.

Vendor Managed Inventory (VMI): A technique used by customers in which manufacturers receive sales data in order to forecast consumer demand more accurately. The vendor uses the sales information to maintain the proper level of inventory for each product that is stocked.

Vision Interface Kit (VIK): to interface the inspection system to factory-floor peripherals such as programmable logic controllers (PLCs), I/O devices, and reject mechanisms. VIKs are used to set camera triggers and lighting strobes and to control discrete output to a PLC that, in turn, may generate a signal to an automated reject mechanism on the line.

Wireless: Communications, monitoring, or control system in which electromagnetic or acoustic waves carry a signal through atmospheric space rather than along a wire. In most wireless systems, radio-frequency (RF) or infrared (IR) waves are used. Some monitoring devices, such as intrusion alarms, employ acoustic waves at frequencies above the range of human hearing.

XML (eXtensible Markup Language): A universal format for structured documents and data on the Web. A file format for representing data, a schema for describing data structure and a mechanism for extending and annotating HTML. Encoding format that is both human-readable and machine-readable. Document Type Definition (DTD) tags carry information pertaining to a data structure and its content within a document. The tags are used by XML interpreters to understand the data contained within a particular document. The design goals of XML emphasize simplicity, generality, and usability over the Internet.

XML/EDI: Provides a standard framework/format to describe different data types so that the information in a transaction, catalogue or a document in a workflow can be searched, decoded, manipulated, and displayed consistently. Combining XML and EDI provides a powerful means of exchanging data between many different types of organizations.

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ANSI MH10.8.2: Data Identifier and Application Identifier Standard.

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ISO/IEC 15418: Information technology – Automatic identification and data capture techniques – GS1 Application Identifiers and ASC MH10. Data identifiers and maintenance. Reference to ANSI MH10.8.2.

ISO/IEC 15459-2: Information technology – Unique identifiers- Part 2: Registration procedures.

ISO/IEC 15459-3: Information technology – Unique identifiers- Part 3: Common rules for unique identifiers.

ISO/IEC 16022: Information technology – Automatic identification and data capture techniques – Data Matrix bar code symbology specification.

ISO/IEC 19762-1: Information technology – Automatic identification and data capture (AIDC) techniques - Harmonized vocabulary – Part 1: General terms relating to AIDC.

ISO/IEC 19762-2: Information technology – Automatic identification and data capture (AIDC) techniques - Harmonized vocabulary – Part 2: Optical readable media (ORM).

ISO/IEC 10646: Information technology – Universal Coded Character Set (UCS).

C FURTHER READING

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D LINKS

AutoID: htpp://www.autoid.org

GS1: htpp://www.gs1.org

ISO International Organization for Standardization: http://www.iso.ch

UIC: http://www.uic.org/spip.php?article528

CEN European Committee for Standardization: http://www.cenorm.be/

United Nations Centre for Trade Facilitations and Electronic Business:
http://www.unece.org/cefact/